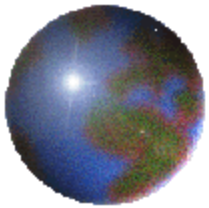

Metódy archeo-geofyzikálneho výskumu (príklady): geoelektrické metódy

doc. Ing. RNDr. René Putiška, PhD., prof. RNDr. Roman Pašteka, PhD.
Univerzita Komenského Bratislava, Prírodovedecká fakulta

Geoelektrické metódy používané v archeológii

- Odporové metódy OM *(resistivity methods)*
- Indukovaná polarizácia *(induced polarization - IP)*
- Elektromagnetické metódy *(Electromagnetic - EM)*
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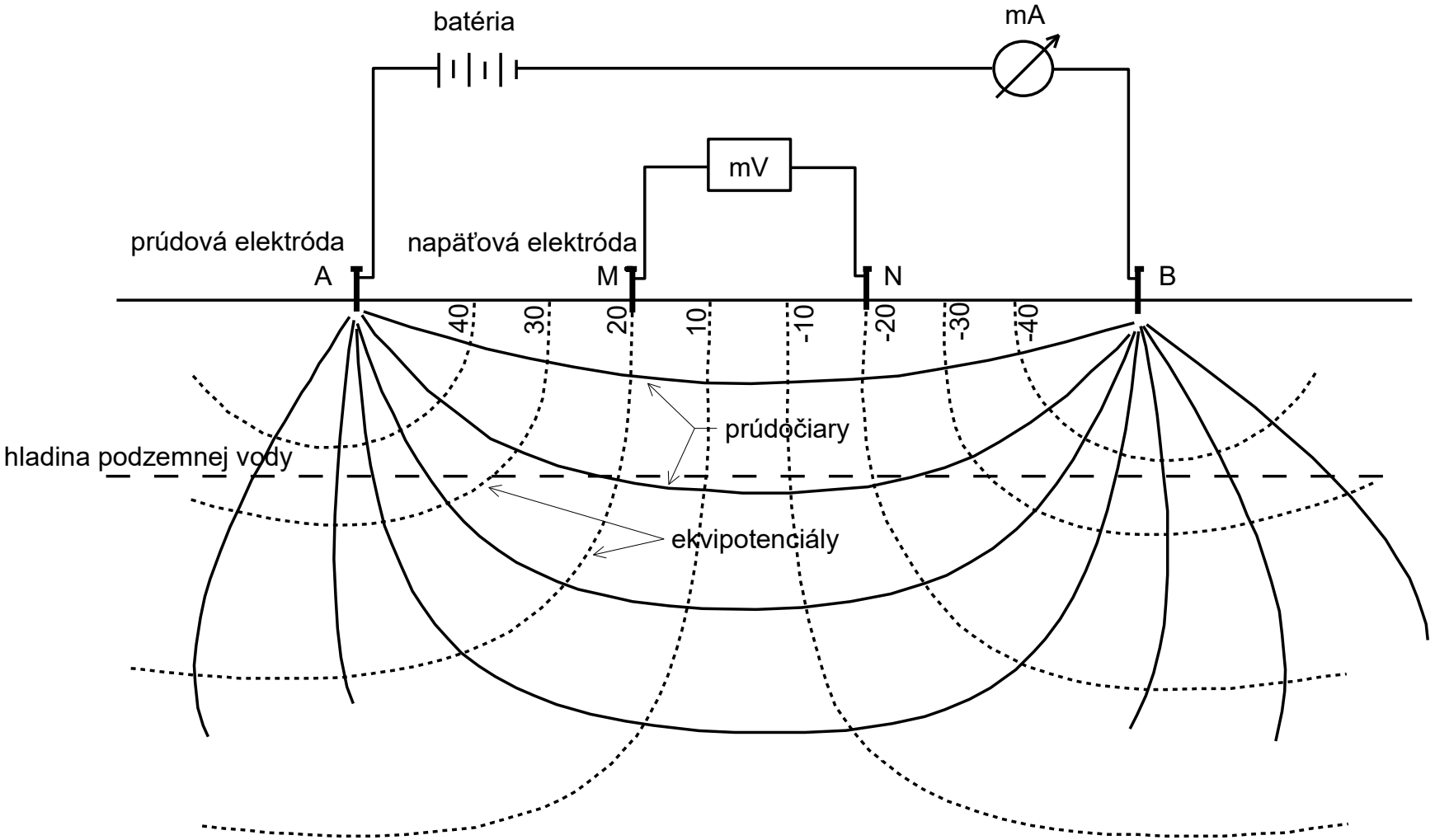
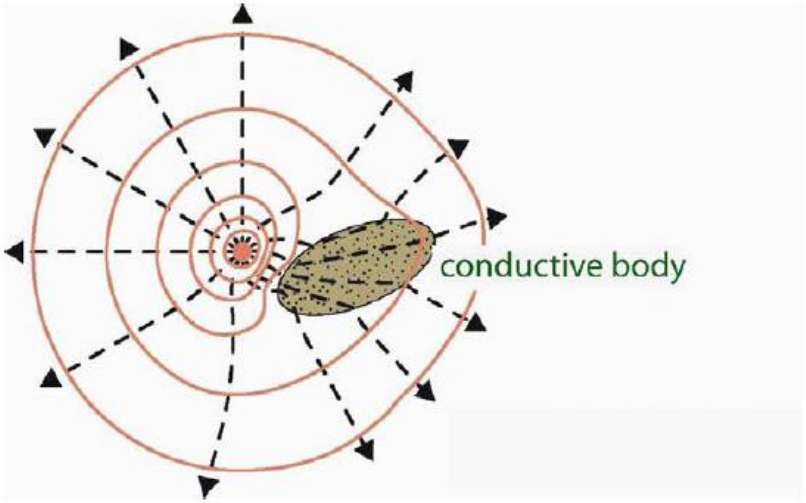
Odporové metódy – základný princíp

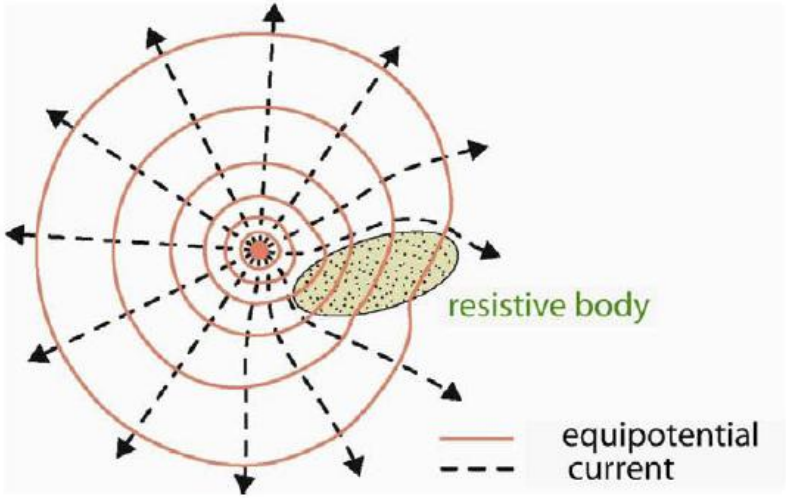


Odporové metódy – základný princíp

- zisťujú merný elektricky odpor prostredia
- zdanlivý merný odpor ρ_z (apparent resistivity ρ_a)
  $\rho_z = k\ U/I$ kde k je usporiadanie elektród



v prípade vodivého telesa sa siločiary elektrického poľa koncentrujú do neho

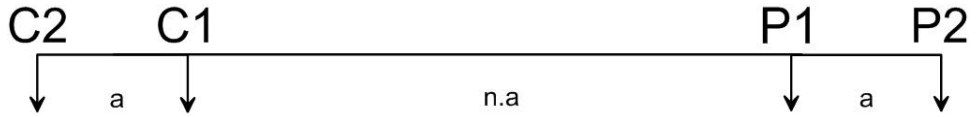


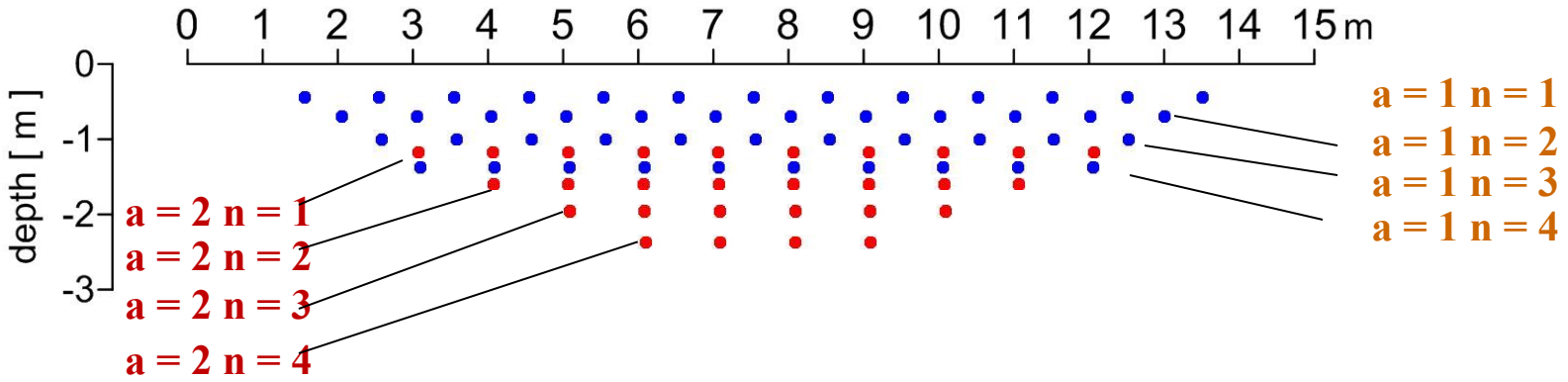
v prípade nevodivého telesa ho siločiary obtekajú

Systém merania metódou ERT - 2D meranie

Elektródové usporiadanie

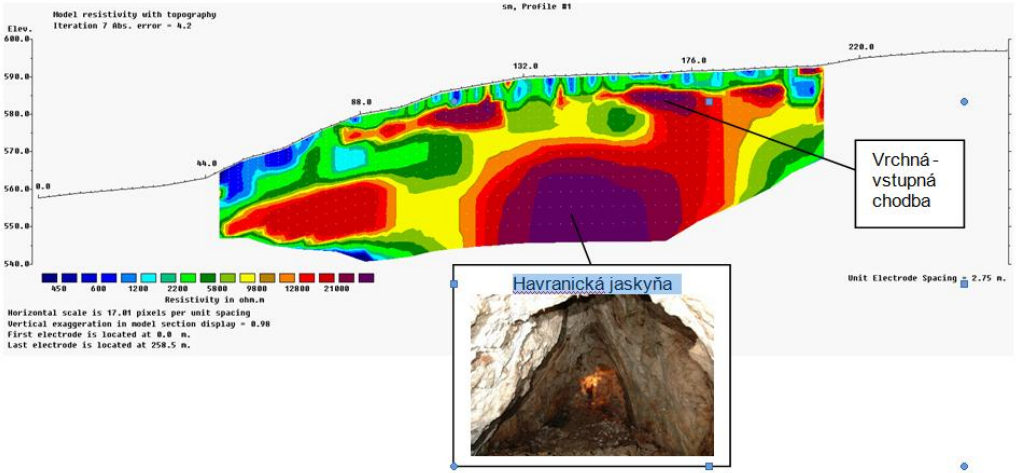
dipól - dipól



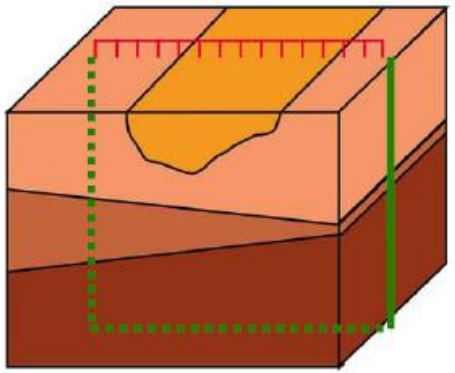


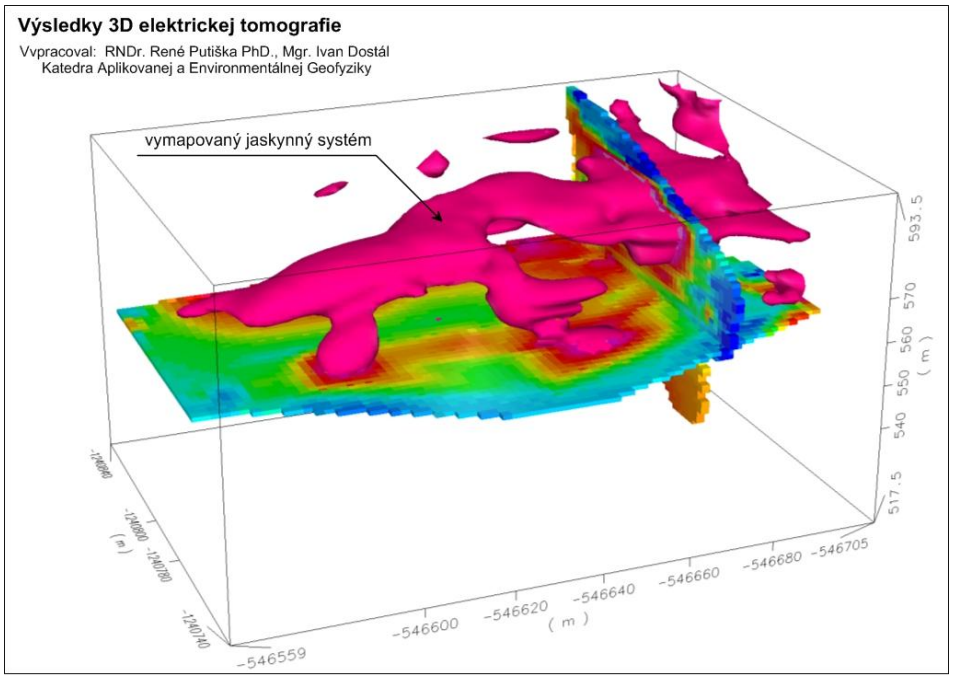
- **kombináciou rôznych hodnôt parametrov „a“ a „n“ môžeme získať vysokú hustotu informácie**

metóda ERT = Electric Resistivity Tomography

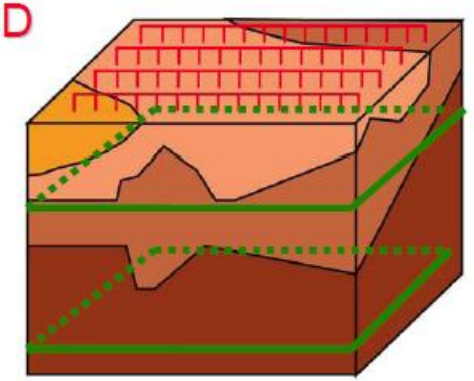

Model resistivity with topography
Iteration 7 Abs. error = 4.2
5m, Profile #1
Elev.
600.0
590.0
580.0
570.0
560.0
550.0
540.0
0.0
44.0
88.0
132.0
176.0
220.0
Vrchná - vstupná chodba
Havranická jaskyňa
450 600 1200 2200 5800 9800 12800 21000
Resistivity in ohm.m
Unit Electrode Spacing = 2.75 m.
Horizontal scale is 17.01 pixels per unit spacing
Vertical exaggeration in model section display = 0.98
First electrode is located at 0.0 m.
Last electrode is located at 258.5 m.

2D

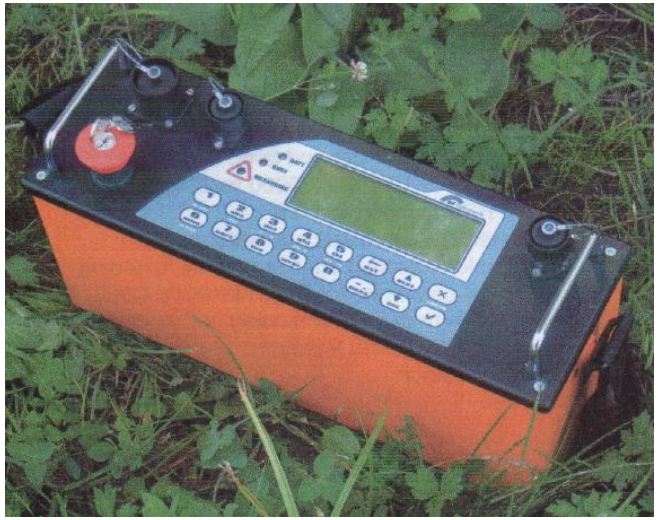



Výsledky 3D elektrickej tomografie
Vypracoval: RNDr. René Putiška PhD., Mgr. Ivan Dostál
Katedra Aplikovanej a Environmentálnej Geofyziky
vymapovaný jaskynný systém
593.5
570
560
550
540
517.5
(m)
-546559
-546600
-546620
-546640
-546660
-546680
-546705
(m)

3D

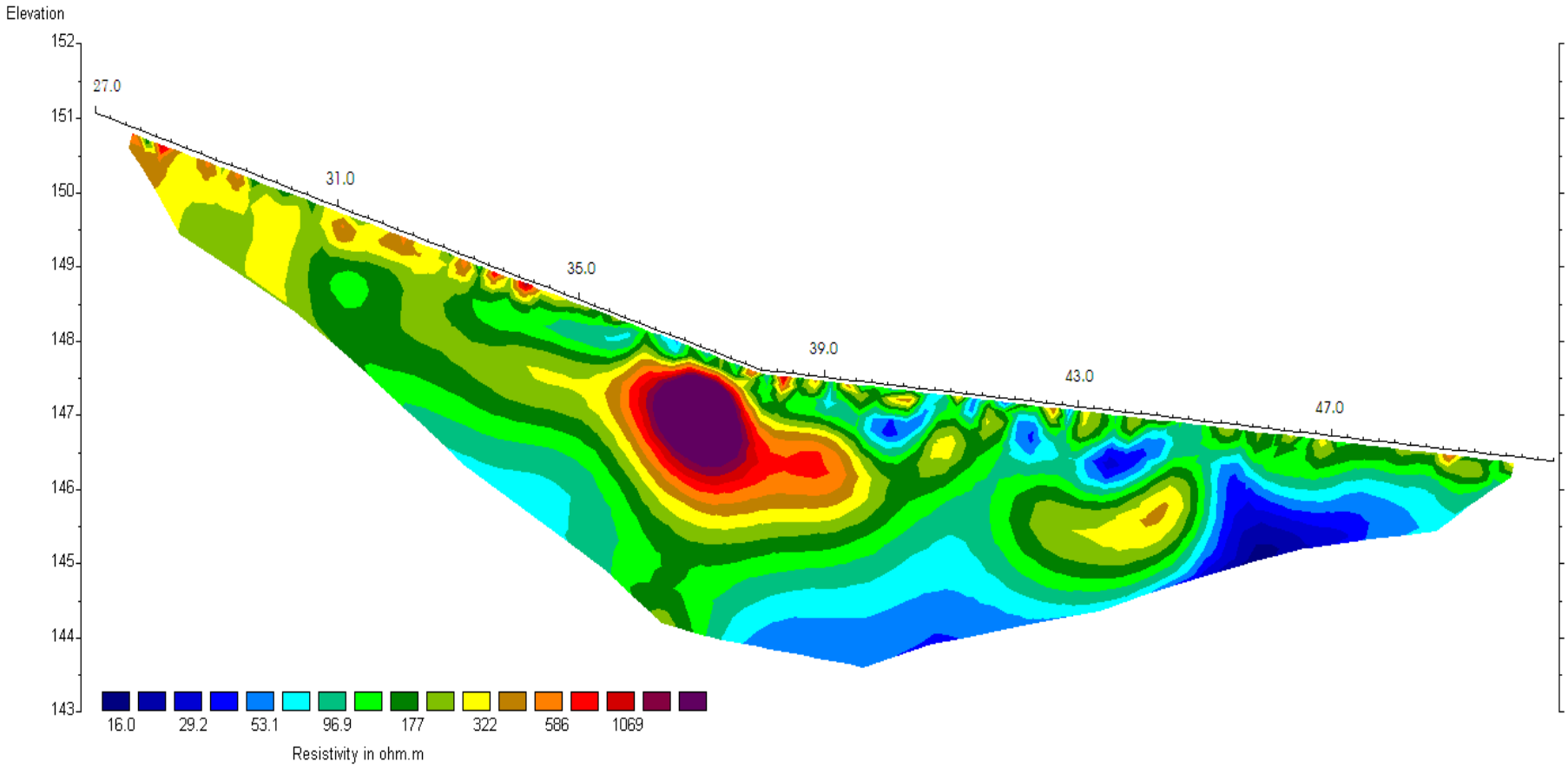


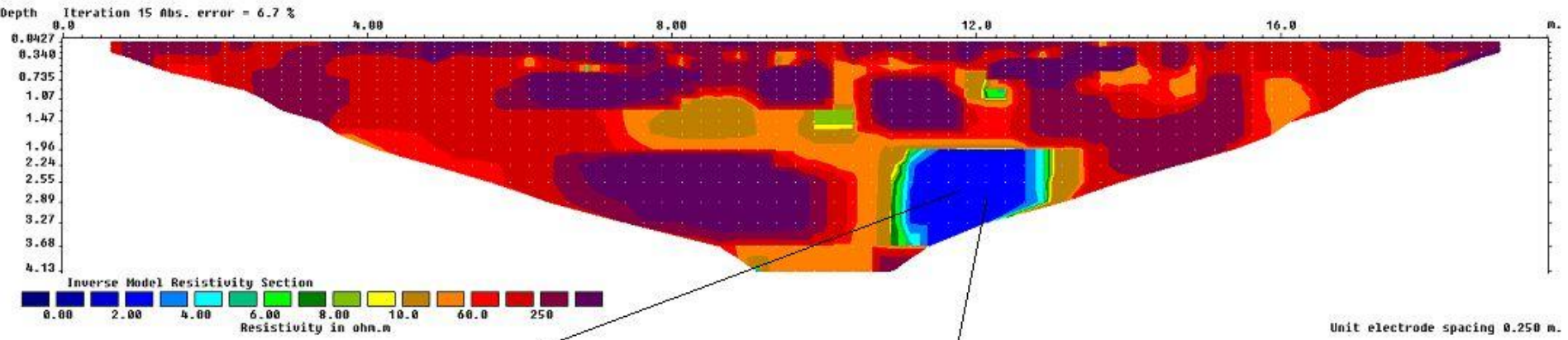
aparatúra ARES (GF Instruments) - metóda ERT




HDI-BINDER

Ukážky nameraných výsledkov

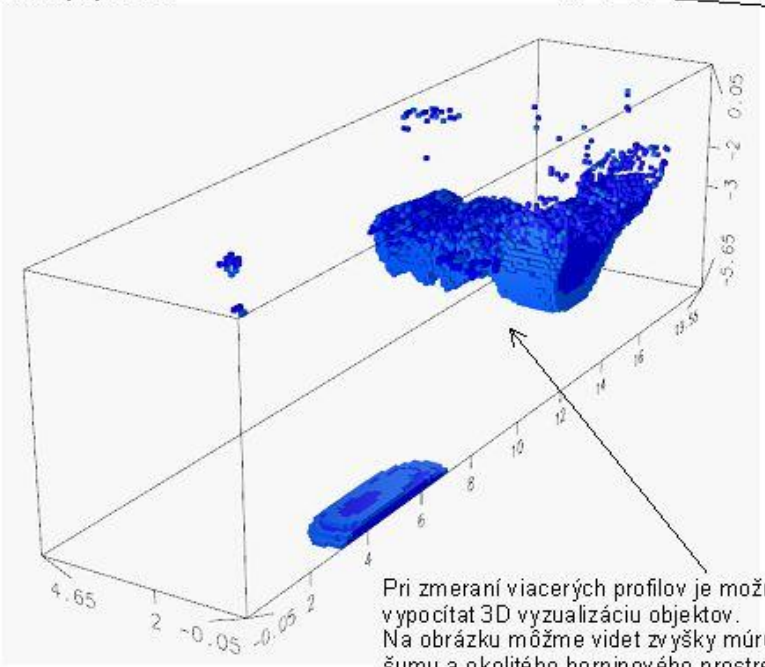




Modrá farba je nameraná anomália, ktorá predstavuje pokracovanie múru.

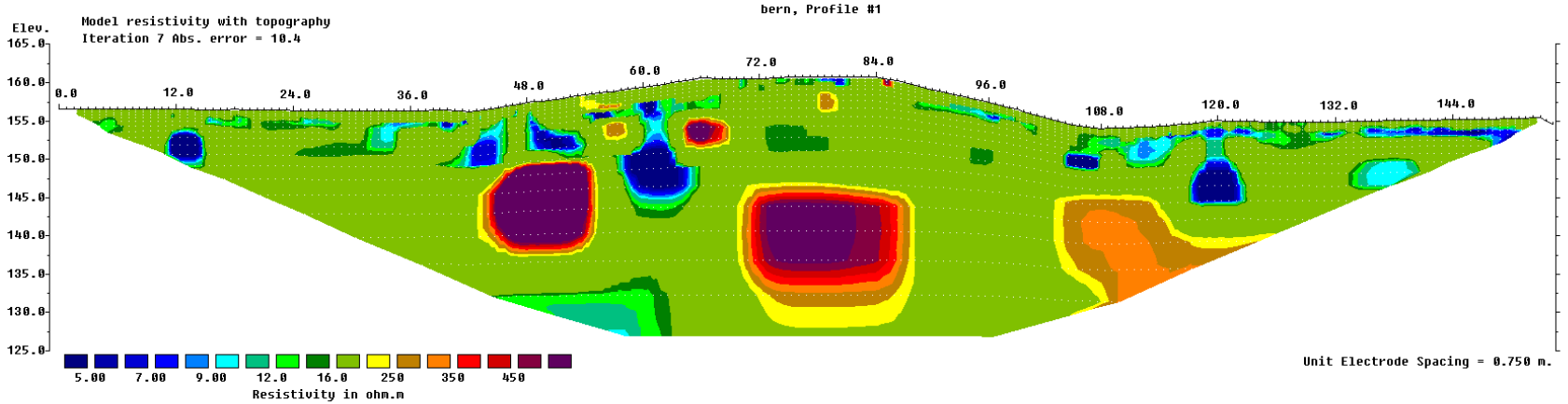
Oranžový kábel je meraný profil, pod ktorým sa nachádza zobrazený výsledok

modrá ciarkovaná je vymapované pokracovanie múru

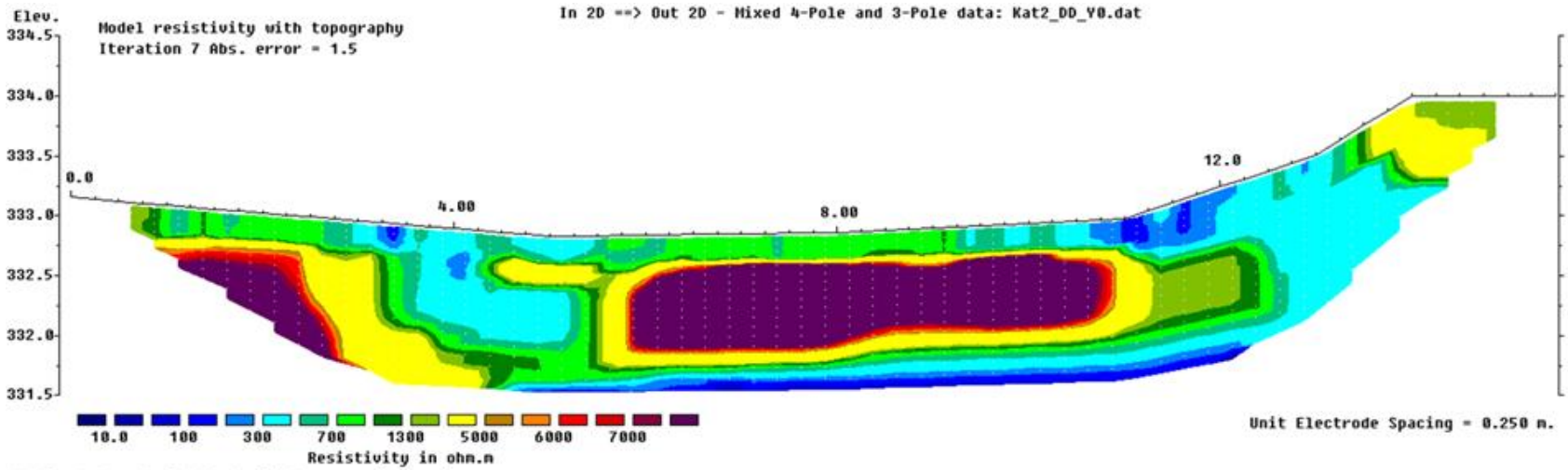


Pri zmeraní viacerých profilov je možné vypocítat 3D vyzualizáciu objektov.
Na obrázku môžme videt zvyšky múru po odfiltrovaní šumu a okolitého horninového prostredia

Odkopaný múr (už zakrytý textíliou) v archeologickej sonde na Bratislavskom hrade



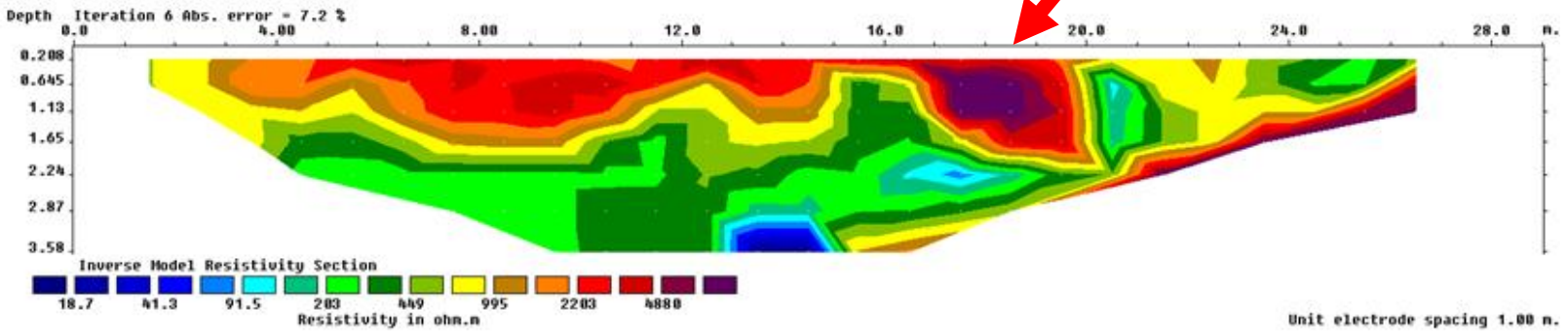
Horizontal scale is 7.76 pixels per unit spacing
Vertical exaggeration in model section display = 0.78
First electrode is located at 0.0 m.
Last electrode is located at 154.5 m.



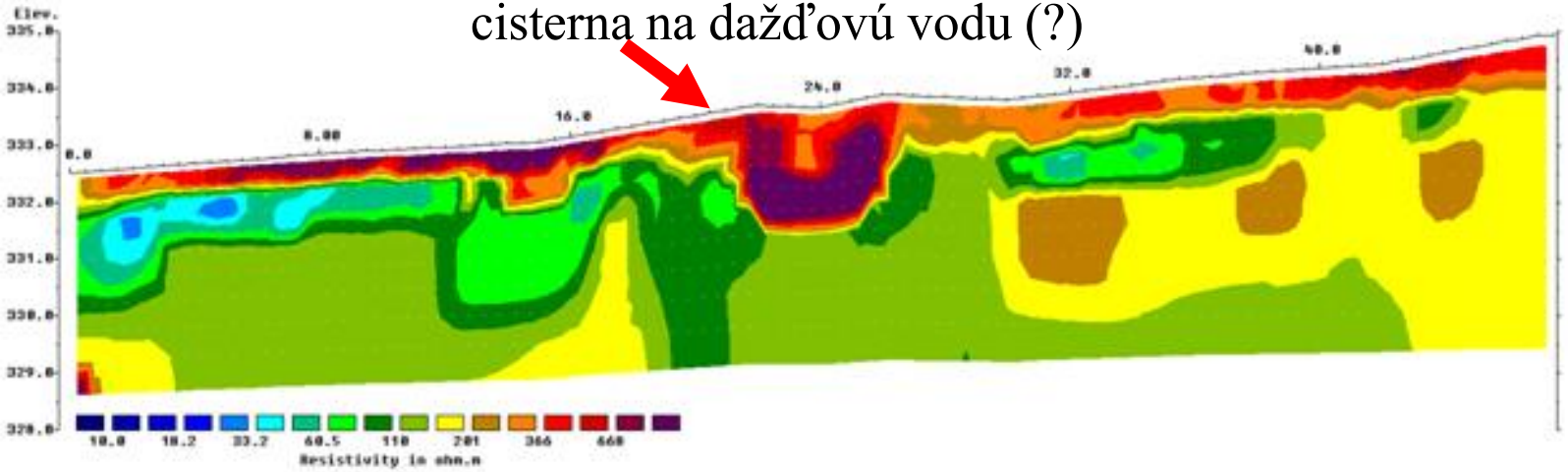
Horizontal scale is 20.69 pixels per unit spacing
Vertical exaggeration in model section display = 1.25
First electrode is located at 0.0 m.
Last electrode is located at 15.5 m.

lokalita Katarínka (pri Trnave),
zaniknutý areál františkánskeho kostola a kláštora

prejavy zvyškov múrov

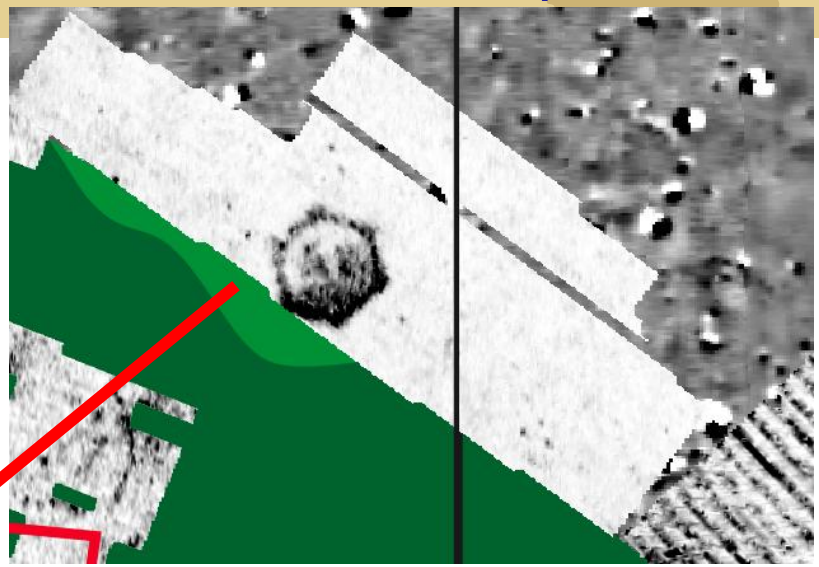


cisterna na dažďovú vodu (?)

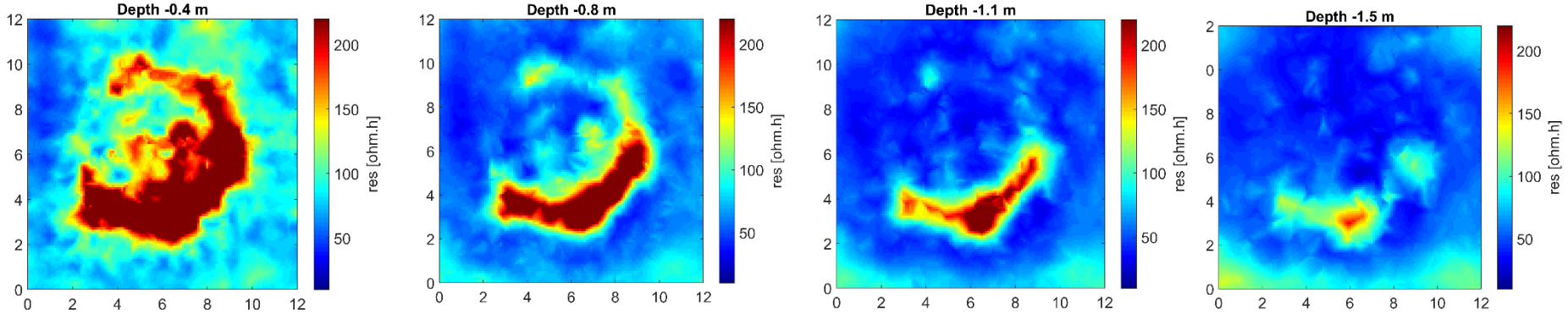


UK grant (2014): 3D ERT

šesťuholníková kaplnka (overovacie merania)

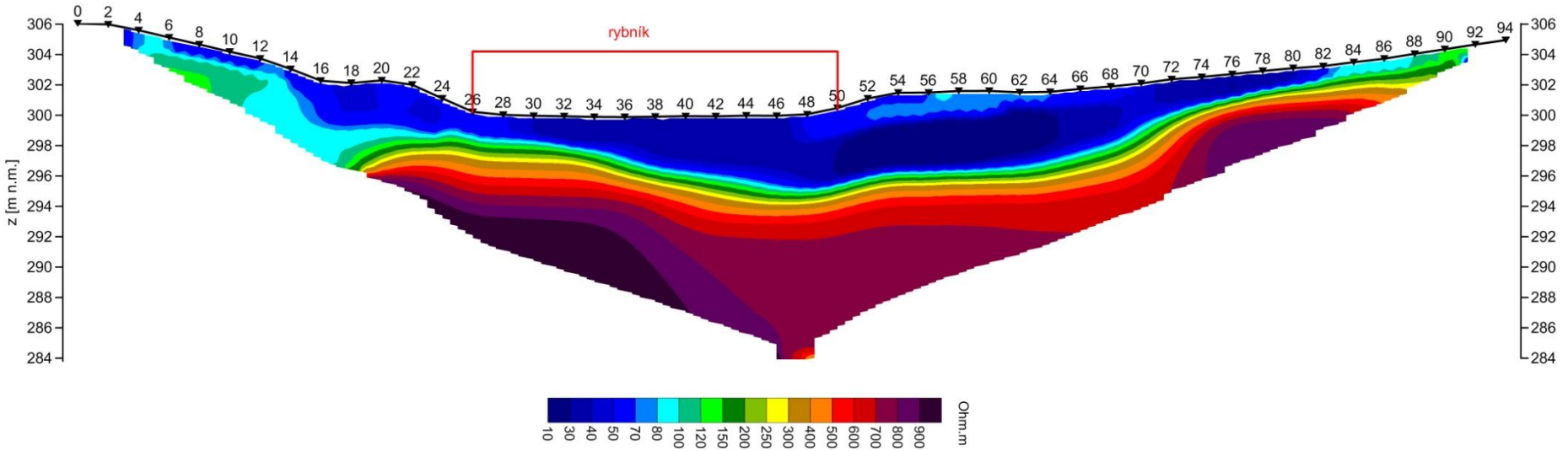


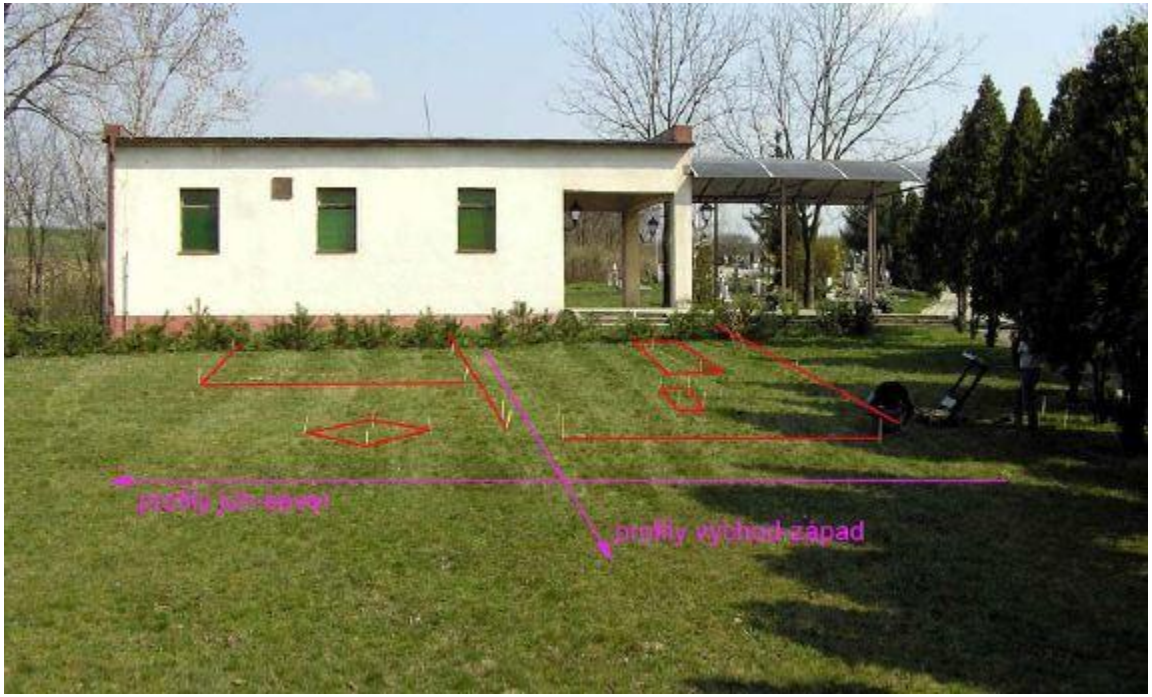
rezy elektrického odporu v rôznych hĺbkach



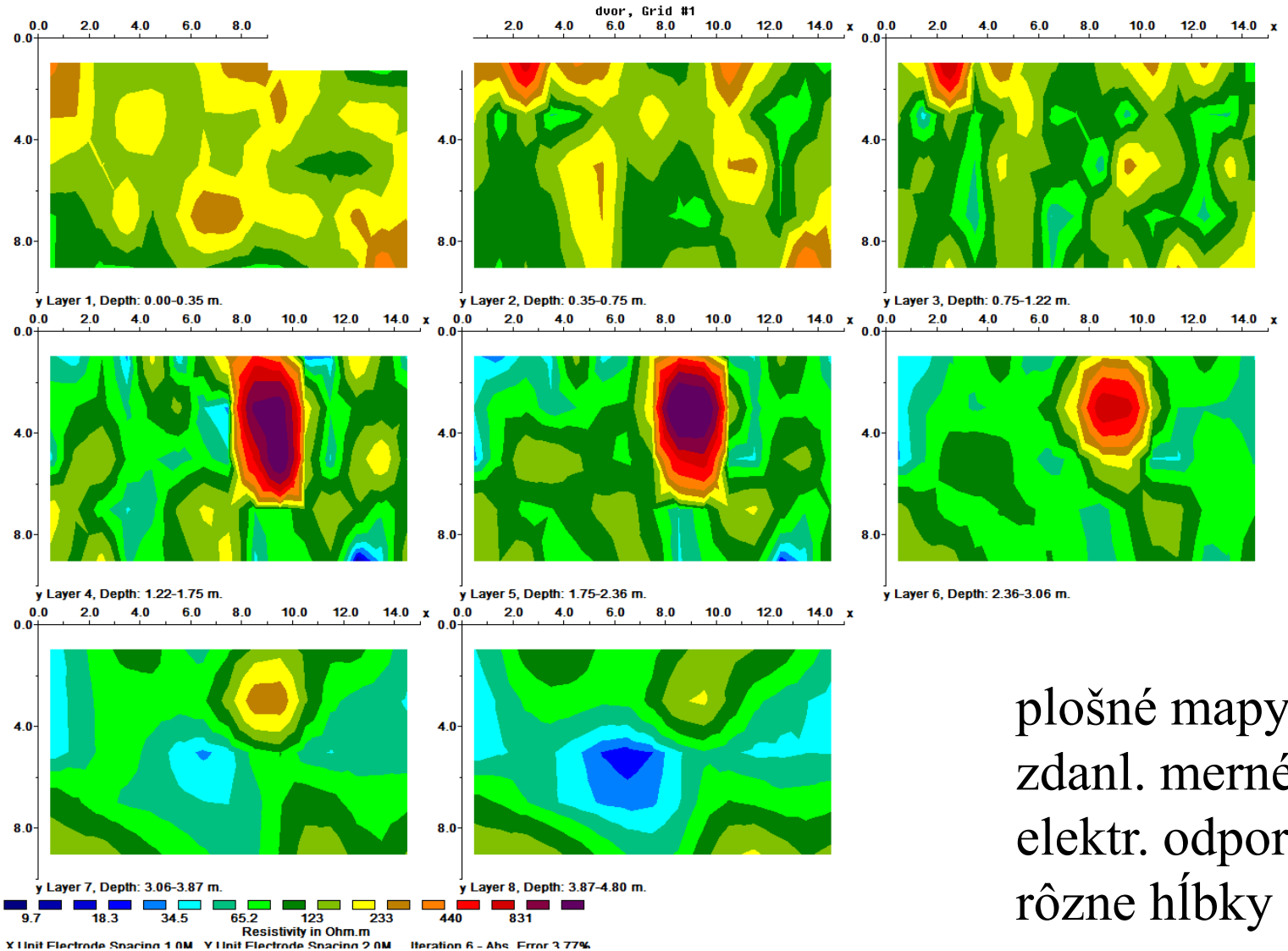
Katarínka – bývalý rybník

ERT





lokalita Dvorníky (pri Hlohovci),
zaniknutý kostolík



plošné mapy zdanl. merného elektr. odporu pre rôzne hĺbky

lokalita Dvorníky (pri Hlohovci),
zaniknutý kostolík – video-inšpekcia krypty

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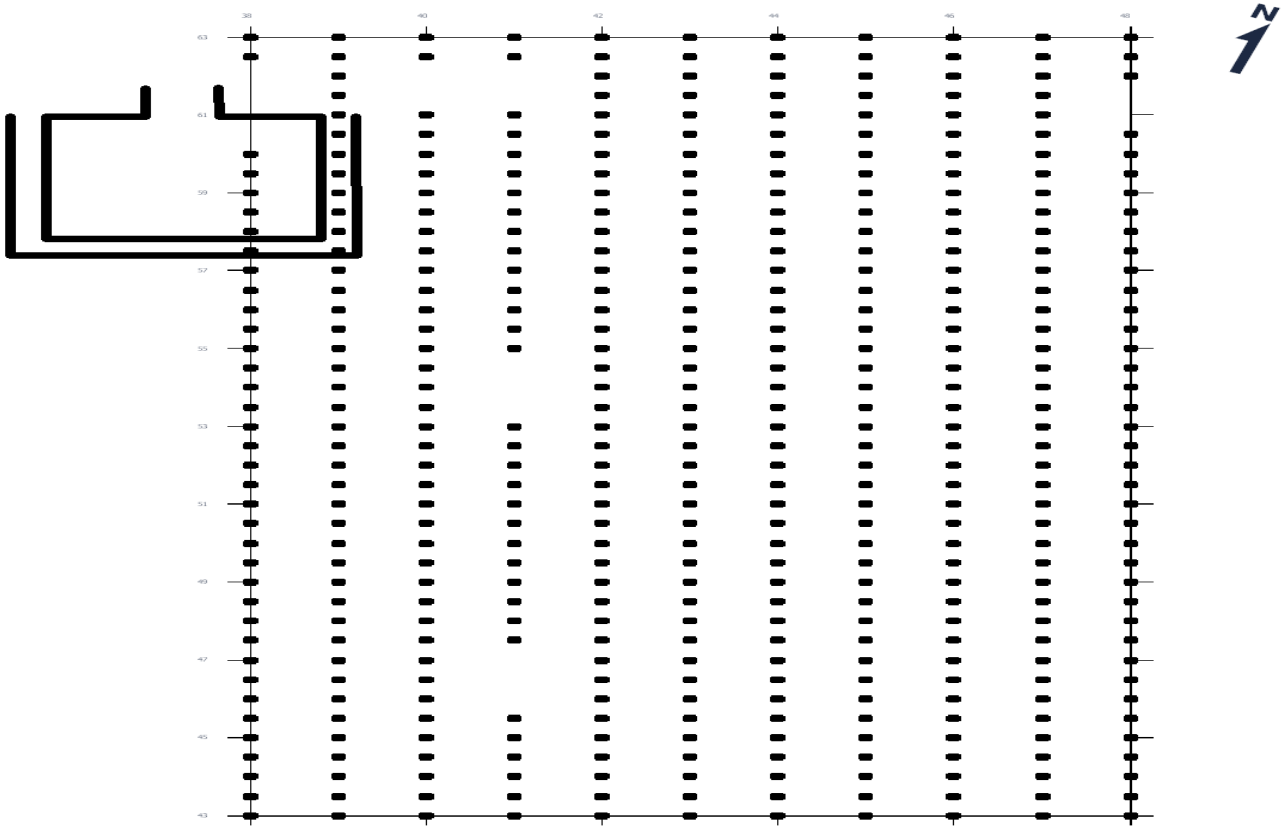
Geonics EM38

obsahuje v sebe vysielaciu
a prijímaciu cievku a pracuje
s EM poľom

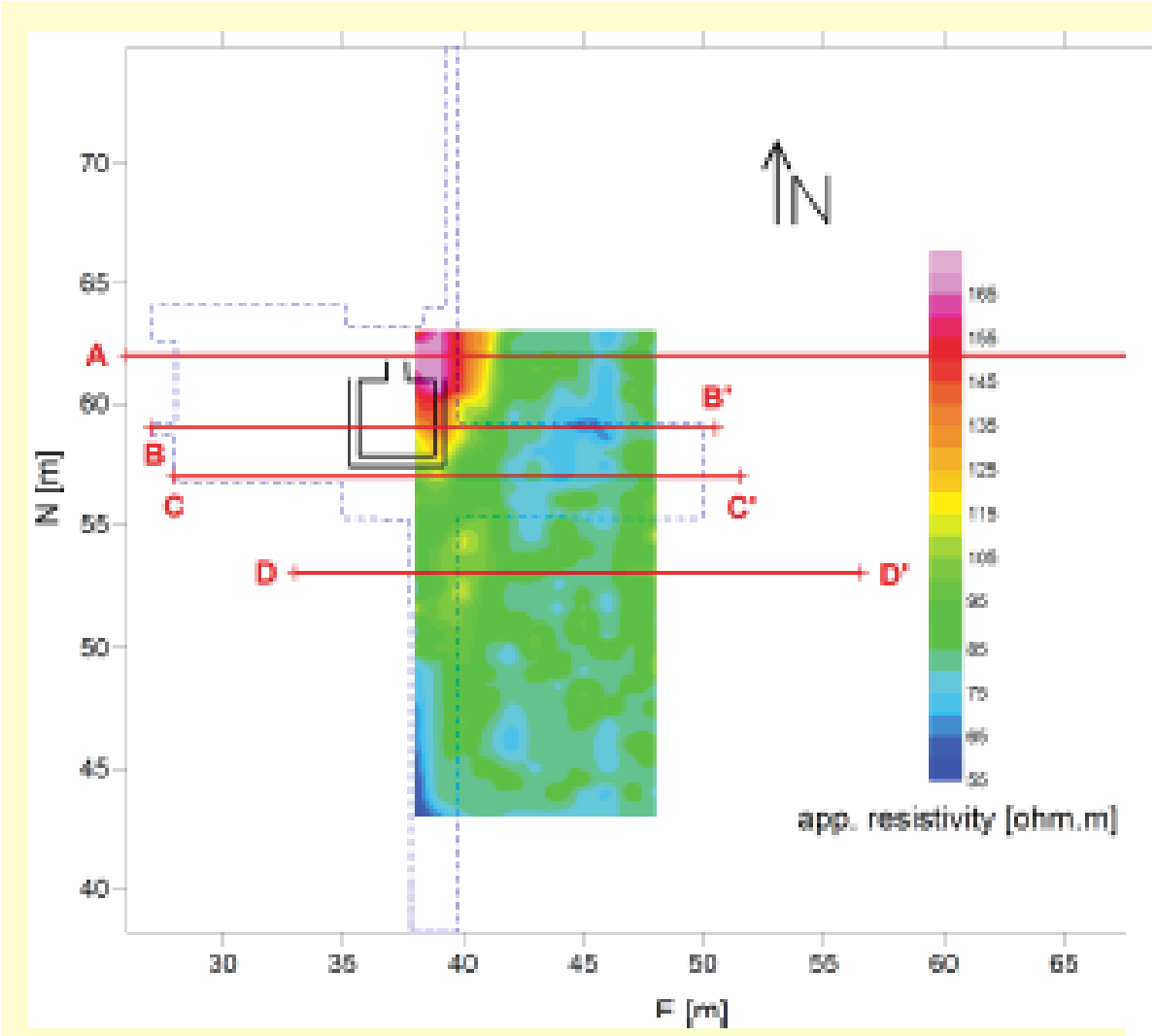
Ukážky nameraných výsledkov

lokalita Iznik (Turecko),
bývalá rímska hrobka

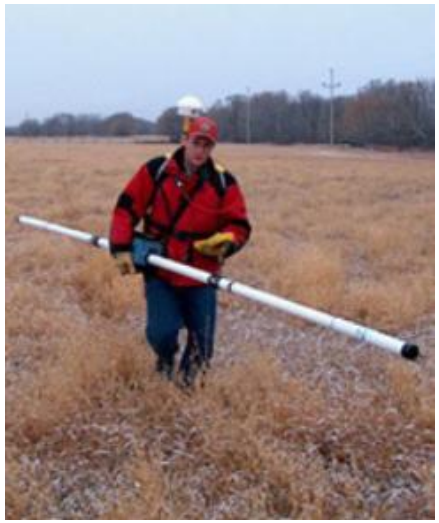
Measurement scheme

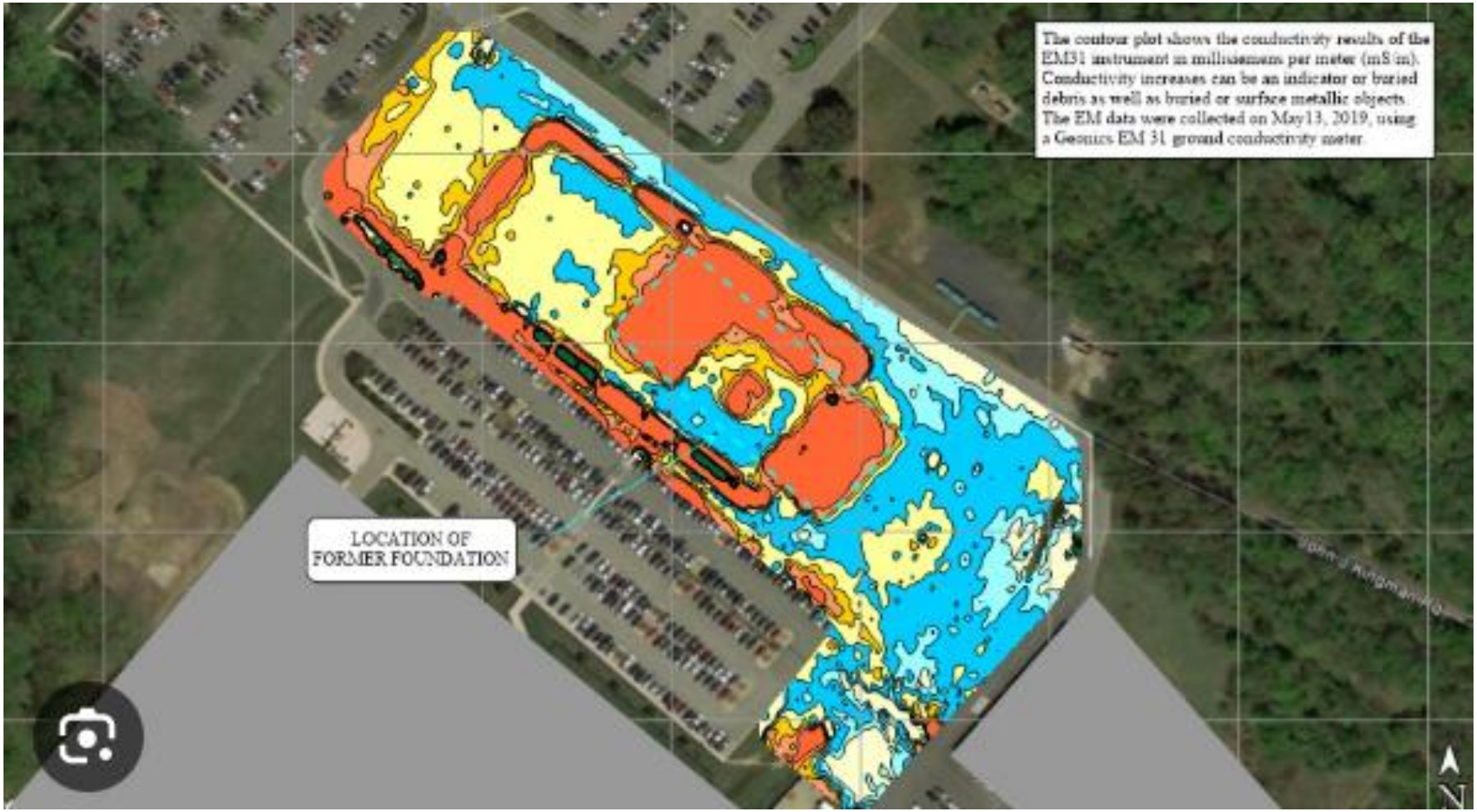


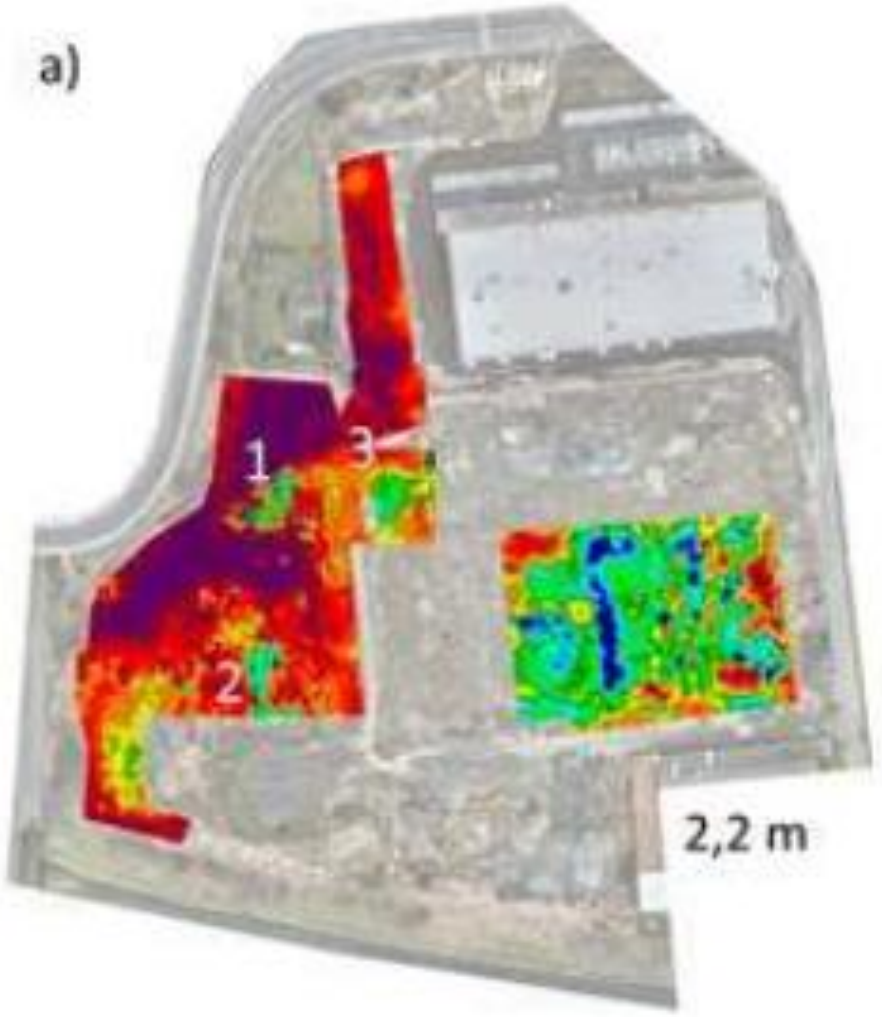
profile distance : 1m sample distance : 0,5m


N
A
B
C
D
B'
C'
D'
70
65
60
55
50
45
40
N [m]
30
35
40
45
50
55
60
65
E [m]
app. resistivity [ohm.m]

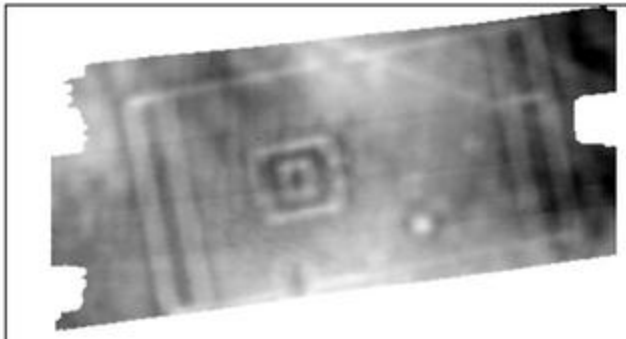
Geonics EM31 (slengovo: „rúra“ alebo DEMP)



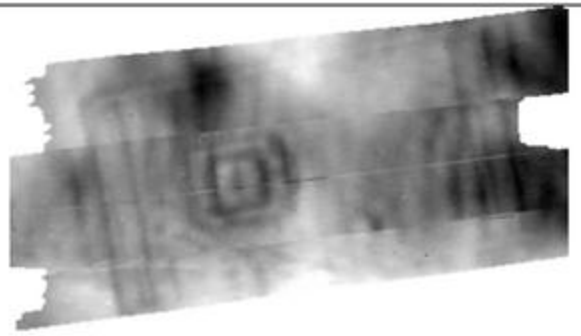

The contour plot shows the conductivity results of the EM31 instrument in millisiemens per meter (mS/m). Conductivity increases can be an indicator or buried debris as well as buried or surface metallic objects. The EM data were collected on May13, 2019, using a Geonics EM 31 ground conductivity meter.
LOCATION OF FORMER FOUNDATION
N



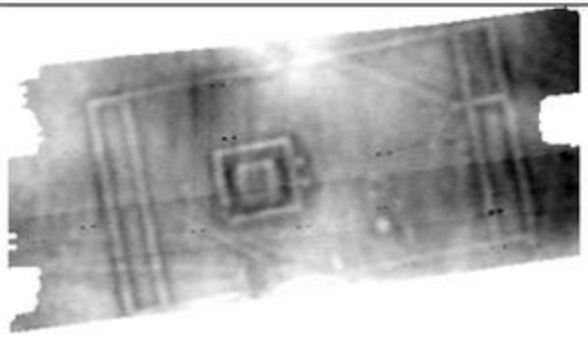
areál bývalej zliatinovej
továrne v Krnove (Česká Republika)



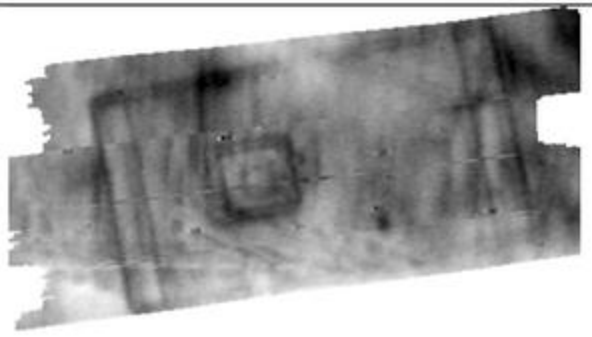
HCP 4m (19 to 39 Ohm.m)



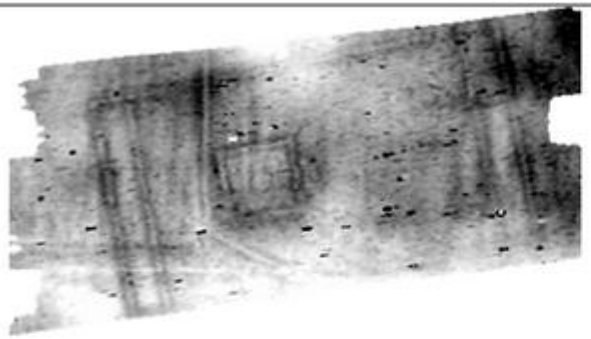
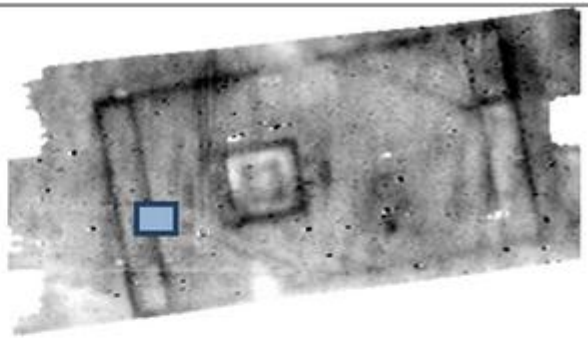
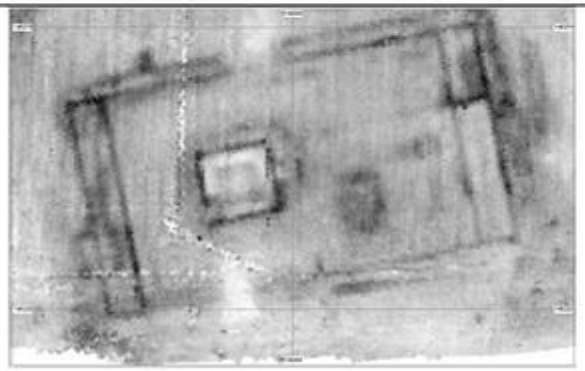
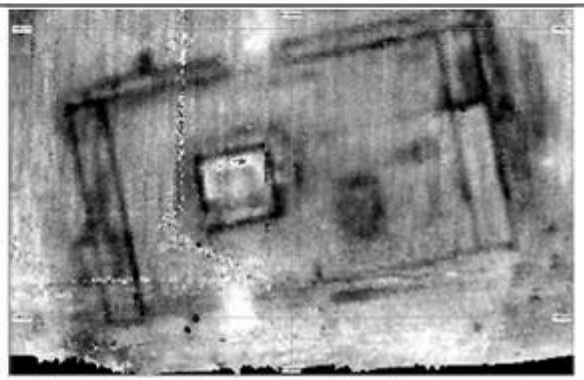
PERP 4.1m (19 to 34 Ohm.m)



HCP2m (19 to 33 Ohm.m)



PERP 2.1m (23 to 45 Ohm.m)

	
HCP1m (27 to 45 Ohm.m)	PERP 1.1m (32 to 65 Ohm.m)
	
ARP® channel 1 (35 to 150 Ohm.m)*	ARP® channel2 (25 to 120 Ohm.m)*